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OF THE
AMERICAN CERAMIC SOCIETY

A MONTHLY PUBLICATION DEVOTED
TO THE PROMOTION OF CERAMIC
EDUCATION AND TECHNOLOGY

SEPTEMBER • 1934

VOLUME 13 NUMBER 9

ESTABLISHED 1869

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THE BULLETIN

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AMERICAN CERAMIC SOCIETY

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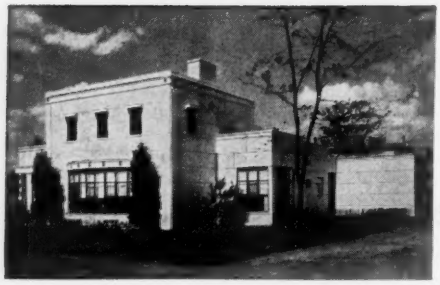

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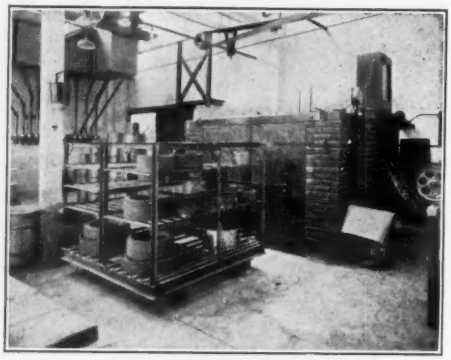

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TOTAL GLASS MELTED (TONS)	7,274	22,087	32,013
TOTAL PRODUCING LIFE (DAYS)	289	648	955
GLASS MELTED PER DAY OF LIFE (TONS)	25.2	34.1	33.5
ACTUAL WORKING DAYS	232	540	768
GLASS MELTED PER ACTUAL WORKING DAY (TONS)	31.4	40.8	41.7
TOTAL REPAIR COST	$14,387.00	$17,487.00	$19,301.00
REPAIR COST PER DAY OF TOTAL LIFE	$49.70	$26.95	$20.20
REPAIR COST PER WORKING DAY	$62.00	$32.40	$25.20
REPAIR COST PER TON GLASS MELTED	$1.97	$0.77	$0.61
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WHITALL TATUM AGAIN REPORTS ON NO. 9 TANK

THE analysis above gives the operating data on Whitall Tatum Tank No. 9 during its entire 32-month campaign just completed.

It also gives the same data for the same tank on its next-to-last repair, when also built with Corhart blocks, and on the previous campaign, when built of high-grade clay blocks.

Please observe that, with Corhart Electrocast, the average repair cost per year has been reduced from $18,130 to $7370, life has been increased 230% *and the repair cost per ton of glass melted has fallen from $1.97 to 61 cents.*

These records are ample justification of the confidence which Whitall Tatum has placed in Corhart Electrocast, ever since the product was first made available. This progressive company installed Corhart Electrocast throughout the melting end of the No. 9 furnace at a time when the product was generally regarded as experimental. Six years of experience proves the soundness of their judgment.

If you would like to have your furnace life extended, your repair-cost per ton of ware reduced, *your profits increased*, ask us to make a recommendation for the use of Corhart Electrocast in your tanks. Address: Corhart Electrocast Company, Incorporated, 16th & Lee Sts., Louisville, Ky. . . *In Europe:* L'Electro Refractaire, Paris. *In Japan:* Asahi Glass Co., Tokio.

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THE BULLETIN

of the American Ceramic Society

A Monthly Publication Devoted to Proceedings
of the Society and Promotion of Coöperative Research
of Technical, Scientific, and Art Questions

Vol. 13 September, 1934 No. 9

EDITORIALS

APPEAL OF THIS SOCIETY TO THOSE WHO CAN NOT READ THE JOURNAL

One of this Society's enthusiastic members said that he could not ask Corporation support of the Society from a company which had no one in its personnel who could read the Society's *Journal* of original researches.

Another member expressed the idea that the *Journal* and the *Ceramic Abstracts* were the essential activities of this Society.

The Constitution of the Society, contrary to these two thoughts, states, "The object of the Society is to advance the ceramic arts and sciences by meetings for the reading and discussion of papers, the publication of scientific literature, and other activities."

Publishing is only one and certainly not the most effective means by which this Society promotes the ceramic arts, science, and technology. Far more effective are the "holding of meetings and other activities."

Should the Society not publish the *Journal* and *Ceramic Abstracts* but devote its available resources to the "holding of meetings and other activities," it would still be worth to ceramic persons and corporations the minimum annual fee now being asked of them. The Society is now devoting a goodly share of its resources to the holding of meetings and to other activities and would do so more largely if its resources were increased, simply because these activities are far more essential than are publications.

The publications are not the purpose; they are means to an end—that of "promoting the ceramic arts, science, and technology." The publications are some of the working tools by which this Society achieves its real purposes.

This Society has often seriously considered a reduction of its publishing activities but always with the conclusion that it is to the advantage of all, even to those who can not read the *Journal* and who find but little thought inspiration in the *Ceramic Abstracts*, that the Society publish reports of original researches and abstracts of the world's literature of value to ceramists.

Each person, no matter how broad his information or how wide his comprehension, can not afford to be wholly self-reliant. Each must depend upon others for searching into and applying much of the information needed to advance his personal and vocational welfare. Each person needs the findings of others.

The results of researches and the practical applications of the many and rapidly increasing disclosures of ceramic science facts are of importance to all ceramic persons and corporations no matter what degree of ability they may have to read the *Journal* and *Ceramic Abstracts*. The factual disclosures of ceramic science and technology in the *Journal* and in *Ceramic Abstracts* cause improved ceramic ware and ceramic processes in which every ceramic person and corporation shares, no matter whether translated by each directly or for them by others.

The economic conditions of ceramic-ware production in the United States, with our unparalleled high labor and material costs, coupled with the ever-increasing severity of ware specifications, demand the most active and concerted searching of ceramic science and technological facts. On this, there is no divergence of opinion. The logical conclusion should be, therefore, that the several means which this Society is using to promote the ceramic arts, science, and technology should have the support of each ceramic person and corporation and that, too, whether or not each can attend the meetings, read the *Journal*, or get productive inspirations from the *Ceramic Abstracts*.

This organized, coöperative, collective promo-

tion of ceramic welfare for thirty-five years has benefited and will continue to benefit all who are engaged in producing ceramic ware, ceramic materials, and ceramic equipment. The Society should be supported by each ceramic person and corporation. It is a well-rounded, going concern, devoted to a single purpose. It is the only such coöperative activity in this country. The Society covers the arts and sciences that are common to all ceramic manufacturing, clay, glass, and enameled ware. The virility of the American Ceramic Society is of vital concern to every ceramic person and corporation.

WESTMAN SHOWS HOW AMERICAN CERAMIC SOCIETY BENEFITS CORPORATIONS

The following classic story, told by A. E. R. Westman, applies to those corporations who insist that the American Ceramic Society contributes nothing to their progress.

A research man once visited a long-established plant where much advanced research work was done. In talking with the president concerning some of the recent findings of their laboratories he suddenly asked,

"Why don't you tell some of the other plants what you've found out?" The president of the corporation was shocked.

"We do all our own research," he boasted, "we don't owe any one anything for a single idea! Why should we give other plants our ideas? Let them work them out for themselves. It would be different if we hadn't reached the place we are today by our own research!"

Together they left the president's office and went on a tour through the plant. They came to the drying room.

"How do you run those fans?" asked the research man.

"With motors, of course," laughed the president amused at such a simple question from a scientist. They went into the mixing room.

"Do motors run those mixers too?" asked the research man.

"Certainly," said the president, a little puzzled. Throughout the plant they saw example after example of motorized operations. When they reached the exit, the scientist turned to the president of the "corporation that did all its own research."

"Congratulations!" said the scientist, "for having had Michael Faraday in your laboratories. Just what year did he work for you?"

OFFER TO THOSE WHO JOIN THE AMERICAN CERAMIC SOCIETY AFTER AUGUST FIRST

The Board of Trustees voted unanimously to prorate the membership fees of those who join as members and who subscribe to the Society's publications after August 1, 1934, if they elect so to do.

New members and subscribers received after August 1 and who elect to receive only the current monthly issues of the *Journal*, the *Ceramic Abstracts*, and *The Bulletin* will be recorded as 1934 members or subscribers on payment in full of their respective annual fees, of $10.00 personal, $25.00 (minimum) corporation, and $12.00 subscriber, the understanding being that the following amounts will be subtracted for the 1934 publications and the remainder applied to their 1935 annual fees:

Month in which subscription is received	Personal	Corporation (minimum fee)	Subscriber
August	$ 4.16	$10.42	$ 5.00
September	3.33	8.33	4.00
October	2.50	6.25	3.00
November	1.66	4.17	2.00
December	.83	2.08	1.00
Annual Fees in 1935	12.50	25.00 (Minimum)	15.00

Those who elect to receive all of the 1934 publications will be expected to pay the annual fees for 1934 in full—$10.00, $25.00 (minimum), and $12.00, respectively, and will pay in full their 1935 fees when bills for the same are rendered next December.

PAPERS

REPORT OF THE JOINT COMMITTEE ON ILLUMINATING GLASSES OF THE GLASS DIVISION OF THE AMERICAN CERAMIC SOCIETY, ILLUMINATING ENGINEERING SOCIETY, THE ILLUMINATING GLASSWARE GUILD[1]

Section A

Modern engineering progress is being made primarily in two ways: namely, the improvement of design and of the materials employed. Although on superficial consideration these two phases may seem essentially different, the engineer finds them to be inseparable. Illuminating engineering is no exception to this generalization. In this field of endeavor, glasses are such important materials as to warrant their study from the viewpoint of providing information to simplify their application to illuminating problems.

In such studies it seems desirable to emphasize those properties of illuminating glasses which are most useful from an engineering (as contrasted with a purely scientific) viewpoint. Thus, the studies are directed to the illuminating performance of various glasses rather than to their physical structures or chemical compositions. These latter aspects are considered only when they assist in providing information which may be useful in selecting the proper glass for a particular type of application. Efforts are directed to the selection of tests and data which are of as fundamental a character as possible, so that they may be of maximum aid to glass technologists and serve as a permanent basis for appraising and comparing glasses for future illuminating purposes.

Although a certain amount of overlapping seems unavoidable, the investigations may be outlined in the following preliminary form:

Section A: The Study of Nomenclature of Illuminating Glasses

Section B: The Classification of Illuminating Glasses

Section C: Studies of Tests and Data for the Properties of Illuminating Glasses

(1) Illuminating Properties
- (*a*) Diffusion
- (*b*) Transmission
- (*c*) Reflection
- (*d*) General Absorption
- (*e*) Selective Absorption or Color
- (*f*) Permanence

(2) Mechanical Properties
- (*a*) Tensile Strength
- (*b*) Modulus of Elasticity
- (*c*) Compressive Strength
- (*d*) Impact Resistance

(3) Thermal Properties
- (*a*) Thermal Conductivity
- (*b*) Coefficient of Thermal Expansion
- (*c*) Specific Heat
- (*d*) Coefficient of Thermal Endurance

(4) Influences of form, dimensions, methods of production, methods of mounting, etc.

General Conceptions of Light-Diffusing Glasses

Most of the glasses of interest to the illuminating engineer are capable of diffusing or scattering light and thus reducing the apparent brightnesses of light sources viewed through them. The term, light-diffusing glass, is applied to glasses which cause beams of light impinging upon them to be deflected at random from their original directions. A glass may be said to be perfectly diffusing if it deflects all of the incident light from its original paths, so that an infinitesimal point of its surface corresponds to a point light source and thus emits light equally in all directions. Such a glass is obviously an idealized or limiting case, which can be approached but not actually attained. The better grades of illuminating opal glasses are approximately perfect diffusers. If an attempt were made to view a light source through such a perfectly diffusing glass, it would be impossible to see the source; and the diffusing glass itself would seem to function as a light source in that its brightness would be equal when viewed or measured from any direction. Also the distribution of light from each element of surface of the glass would conform to the cosine law of emission.

The extreme opposite of a perfect diffuser is typified by non-diffusing or transparent glass. On looking through such a glass toward a light source, there is virtually no diffusion, and the outline of the source appears sharp and well defined. If a plate of glass of this type is placed in the path of a beam of light emitted by a source, only a slight deviation from the inverse square law results. Between these extremes, there are

[1] Received from H. H. Blau, August 2, 1934.

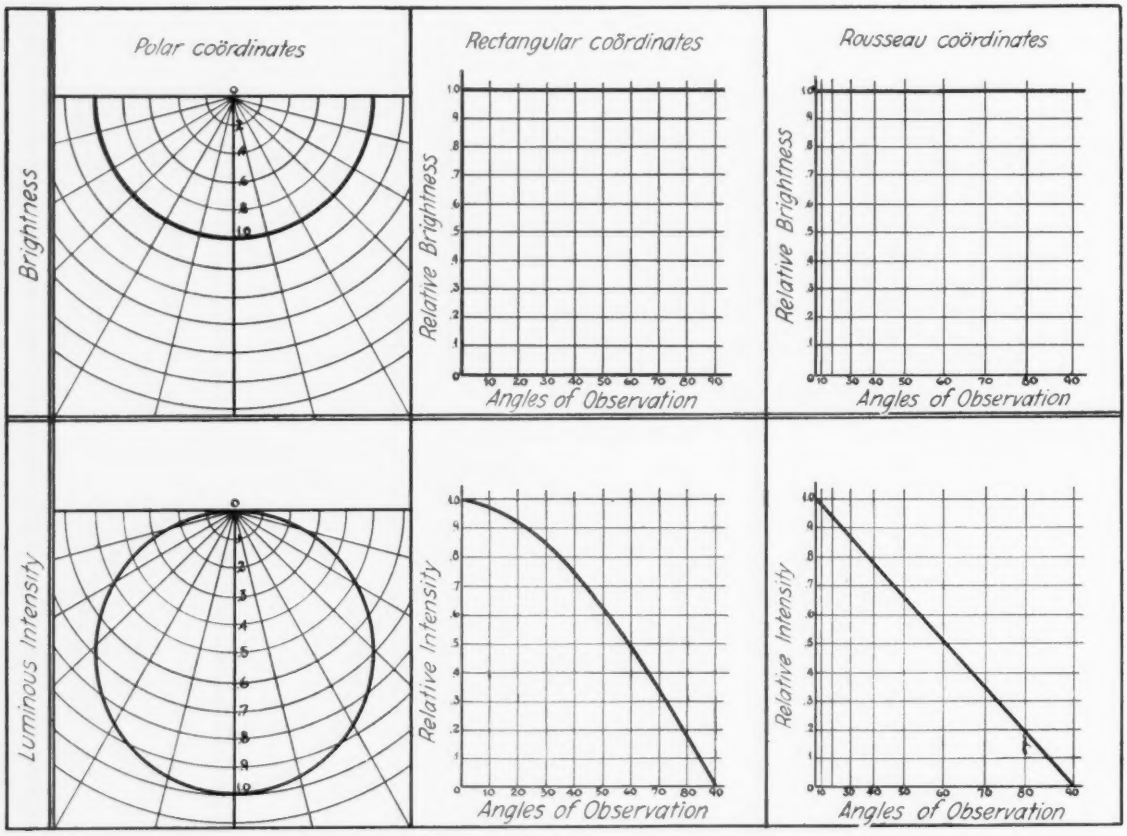

FIG. 1.—Comparison of methods of representing the light-diffusing properties of perfect diffusers.

many intermediate stages and variations of diffusing properties.

The extent to which the properties of a glass approach those of a perfect diffuser may be evaluated either in terms of brightness or luminous intensity. Three methods for graphically representing each of these properties for a perfect diffuser are shown in Fig. 1. Although the use of polar coördinates may assist in visualizing the comparative properties of glasses for specific purposes, the simplicity and directness of comparison on the basis of the rectangular representation of brightness recommend this method. The use of Rousseau coördinates for comparing or evaluating glasses on the basis of luminous intensity likewise offers advantages.

Representative Types of Diffusing Glasses

Two types of diffusing glasses, namely, mat and "cloudy" glasses, stand out as representative, both from the standpoint of their light-modifying properties and the methods by which they are produced. As examples, they afford the incidental advantages of being widely known and used.

Mat glasses are produced by roughening the surface or surfaces of a glass by treatment with chemical reagents or by mechanical means. As a result, they present an irregular surface made up of many small surface elements inclined at varied, random angles. The diffusion of the light is principally a result of refraction at these surfaces and is thus purely a surface phenomenon. Accordingly, the illuminating properties of most mat glasses are practically independent of their thicknesses. The influence of thickness on the properties becomes important only in the exceptional cases of very thick or of highly-absorbing glasses. Even though mat glasses are not transparent, they possess a relatively low diffusing power. There is but little change in the illuminating properties of mat glasses on reversing them so that the smooth instead of the roughened surface is toward the light source. Similarly, the influence of the wave-length of the incident light is very slight, since the dimensions of the tiny

facets or surface elements are ordinarily greater than the maximum wave-lengths of visible light.

The term "cloudy glass" is used here generically to embrace opal, opalescent, alabaster, and similar glasses, in which the diffusion results from the presence in a glassy matrix of myriads of tiny particles of different indices of refraction from that of the glassy matrix itself. The mechanism by which these glasses diffuse light apparently involves refraction, reflection, and diffraction by these small (usually colorless) particles which are imbedded in the glass. The optical properties of such glasses vary markedly with changes of thickness and in many cases with differences in the wave-lengths of the light. Even "cloudy glasses" with relatively high diffusing powers may be somewhat transparent.

A rather simple experiment directly illustrates by contrast the characteristic properties of these two groups of glasses. If a light source of the form of a definite point or line is viewed through a piece of mat glass held a few inches from the source, its image appears to be rather obscure—the degree of obscurity depending upon the type of the roughened glass surface. If a very thin piece of opal (as an example of "cloudy" glass) is substituted for the mat glass, the image of the light source is quite sharp and distinct, although it is of much lower intensity and usually of an orange or reddish tint. If progressively thicker sections of the opal glass are interposed, the image of the source becomes correspondingly fainter and finally vanishes completely without any apparent intermediate decrease in the distinctness of the outline of the image.

This experiment directly illustrates the fact that mat glasses do not apparently transmit any appreciable amount of undeflected light, that is, they do not exhibit regular or undiffused transmission. By contrast, the "cloudy" glasses definitely manifest such a regular, undiffused transmission. This distinction is of primary importance in the classification and description of diffusing glasses.

In addition to these principal types of diffusing glasses, there are several important subgroups. For example, there are the configurated glasses which are fundamentally similar to the mat glasses but differ in that their irregular surface elements are readily visible to the naked eye; that is, the irregularities of the roughened surfaces are macroscopic rather than microscopic.

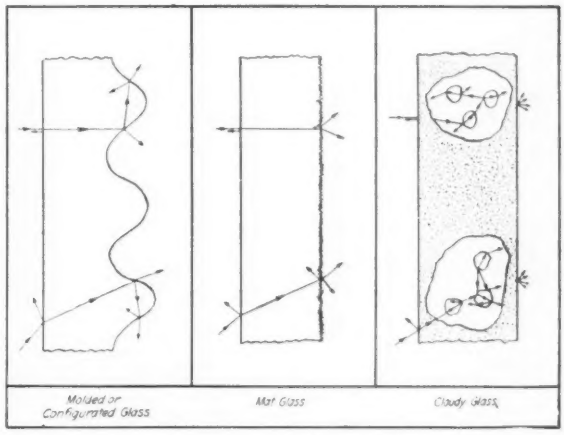

FIG. 2.—Types of diffusing glasses.

The configurated glasses differ further in that the irregularities are imparted to their surfaces while the glass is hot and pliable, in contrast to the roughening of mat glasses which usually occurs after they have been formed and solidified.

General Definitions

In discussing various types of illuminating glasses, it becomes desirable to use consistently certain terms designating their properties. The pertinent nomenclature and definitions previously adopted by the Committee on Nomenclature and Standards of the Illuminating Engineering Society are included here for completeness. They are as follows:

Light: For the purposes of illuminating engineering, light is radiant energy evaluated in proportion to the luminous sensation produced by it.

Brightness: Brightness is the quotient of the luminous intensity of a surface measured in a given direction by the area of this surface projected on a plane perpendicular to the direction considered. (In practice, no surface obeys exactly the cosine law of emission or reflection; hence the brightness of a surface generally is not uniform but varies with the angle at which it is viewed.)

Diffusing: Diffusing surfaces and media are those which break up the incident light and distribute it more or less in accordance with the cosine law, as for example, rough plaster and opal glass.

Redirecting: Redirecting surfaces and media are those which change the direction of the light in a definite manner; as for example, a mirror or a prism.

Scattering: Scattering surfaces and media are those which redirect the light into a multiplicity of separate pencils by reflection or transmission, as for example, rippled glass.

Regular or Specular Reflection: Regular or specular reflection is that in which the angle of reflection is equal to the angle of incidence.

Diffuse Reflection: Diffuse reflection is that in which the light is reflected in all directions.

Perfectly Diffuse Reflection: Perfectly diffuse reflection is that in which the reflected light is distributed in accordance with the cosine law, so that the reflecting surface appears equally bright from all angles of view. (The reflection from a body may be regular, diffuse, or mixed. In most practical cases there is a superposition of regular and diffuse reflection.)

Regular Reflection Factor: The regular reflection factor of a surface or a body is the ratio of the regularly reflected light to the incident light.

Diffuse Reflection Factor: The diffuse reflection factor of a surface or a body is the ratio of the diffusely reflected light to the incident light.

Reflection Factor: The reflection factor of a body is the ratio of the light reflected by the body to the incident light. It is the sum of the regular and the diffuse reflection factors.

Diffuse Transmission: Diffuse transmission is that in which the transmitted light is emitted in all directions from the transmitting body.

Regular Transmission: Regular transmission is that in which the transmitted light is not diffused. In such transmission the direction of a transmitted pencil of light has a definite geometrical relation to the corresponding incident pencil. When the direction of the light is not changed, the transmission is called direct.

Perfectly Diffuse Transmission: Perfectly diffuse transmission is that in which the transmitted light is distributed in accordance with the cosine law, so that the surface of the transmitting body appears equally bright from all angles of view.

(The transmission of light by a body may be regular, diffuse, or mixed. In many practical cases there is a superposition of regular and diffuse transmission.

It should be noted also that transmission factors as defined below refer to the ratio of light emerging from the body concerned to the light incident upon it. Reflections at the surfaces, as well as absorption within the body, therefore operate to reduce the transmission.

Since transmission and reflection factors depend in general on the angle of incidence, this angle should be stated. If the angle is not given, incidence is assumed to be practically normal. Transmission and reflection factors frequently vary also with the quality of light used, and consequently it should be specified or the illuminant should be stated.)

Regular Transmission Factor: The regular transmission factor of a body is the ratio of the regularly transmitted light to the incident light.

Diffuse Transmission Factor: The diffuse transmission factor of a body is the ratio of the diffusely transmitted light to the incident light.

Transmission Factor: The transmission factor of a body is the ratio of the light transmitted by the body to the incident light. It is the sum of the regular and the diffuse transmission factors.

Absorption Factor: The absorption factor of a body is the ratio of the light absorbed by the body to the incident light. (The absorbed light is the difference between the incident light and the sum of the transmitted and the reflected light.)

It is believed advisable to submit any additional recommendations for the designation of different types of diffusers (including glasses) to the Nomenelature and Standards Committee for its action to avoid possible confusion.

In the belief that a unified use or understanding of the names applied to various glasses may result in a minimum of confusion and equivocation, a glossary of terms for designating different glasses has been drafted to cover molded, flat, blown, and shaped glasses for use with artificial or natural light.

Nomenclature for Illuminating Glasses[2]

Opal Glass: A highly diffusing glass having a nearly white, milky, or gray appearance. The diffusing properties are an inherent, internal characteristic of the glass.

Opalescent Glass: A type of opal glass having the properties of selectively transmitting and diffusing light with a resultant fiery appearance when used with concentrated incandescent sources of light. Sometimes referred to as fire opal.

Alabaster Glass: A glass simulating natural alabaster and having a gray or paraffin-like appearance. For a given thickness, it usually has less diffusion than opal glass.

The true alabaster appearance results from the internal structure of glass of proper composition, rather than from surface treatment or casing. An alabaster appearance can also be obtained by casing an opal glass with clear glass, and while this should be classed as a cased glass, it is sometimes referred to as alabaster.

Cased glass: A glass composed of two or more layers of different glasses, usually a clear, transparent layer to which is added a layer of opal, opalescent, or colored glass. This glass is sometimes referred to as flashed, multilayer, polycased, etc.

Homogeneous Glass: A glass of essentially uniform composition throughout its structure. (This term is here used to distinguish from cased glass which is composed of two or more layers of different compositions, rather than to appraise on the basis of freedom from streaks, striae, etc.)

Enameled Glass: A glass which has had applied to its surface a coating of enamel. These enamels may be white or colored and may have varying degrees of diffusion.

Decorated Glass: A glass to which etchings, stains, enamels, etc., are applied primarily for decorative purposes.

Mat Surface Glass: A glass whose surface has been altered by etching, sandblasting, grinding, etc., to increase the diffusion. Either one or both surfaces may be so treated.

Configurated Glass: A glass having a patterned or irregular surface. The surface configuration is usually applied during fabrication. Such glasses are not transparent and are somewhat diffusing.

[2] Although the following definitions directly cover only colorless glasses, they may be extended to tinted or colored glasses by applying the proper adjectives in each case. For example, opal glass may possess an amber tint and may then be described as "amber opal glass."

Glasses falling under this classification are often referred to as pebbled, stippled, rippled, hammered, patterned, chipped, crackled, cathedral, etc., depending upon the particular type of surface.

Prismatic Glass: A clear glass into whose surface is fabricated a series of prisms, the function of which is to direct the incident light in desired directions.

Antique Glass: A glass of relatively smooth surface having a slight degree of non-uniform diffusion due to the intentional presence of bubbles, striae, fissures, etc.

Transparent Glass: Glasses falling under this classification have no apparent diffusing properties. Such glasses are sometimes referred to as flint, crystal, clear.

Polished Plate Glass: A glass whose surface irregularities have been removed by grinding and polishing, so that the surfaces are approximately plane and parallel.

Window Glass: Transparent, relatively thin, flat glass having glossy, fire-finished, apparently plane and smooth surfaces, but having a characteristic waviness of surface which is visible when viewed at an acute angle or in reflected light.

Joint Committee on Illuminating Glasses

Members

H. H. Blau, Macbeth-Evans Glass Company, *Chairman*.
E. C. Crittenden and A. N. Finn, Bureau of Standards.
H. P. Gage, Corning Glass Works.
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DISCUSSION OF THE EFFECT OF DE-AIRING ON THE FIRED PROPERTIES OF A TERRA COTTA BODY*

By R. L. Clare

I. Introduction

This subject is presented for discussion to bring out existing information, if any, on the effect of de-airing on the physical properties of a fired terra cotta body.

The apparent benefits of this method on the machine-extruded material have been noteworthy and much has been written on this subject. There is some uncertainty, however, as to its effect on the hand-pressing operation and it is not definitely settled whether it is easier to press and stick the various faces and partitions of a hand-made piece from an evacuated clay or to press it from the mixture now in use. This question warrants some investigation.

Too little attention has been given to the effect of de-airing on the body in the fired state. There are no reasons to believe that the results will be anything but beneficial, but the effect of this process on certain of the physical properties should be known definitely.

How does it affect the water-smoking, oxidation, and shrinkage of the body during the firing process? Does it actually make the fired body denser and therefore stronger, and if so, how much?

It would be interesting to know the effect of this process on the resistance of the body to freezing and thermal shock.

At the last meeting of the Ceramic Association of New Jersey in Trenton in 1933, a symposium on de-airing was presented in which these same questions were asked. It was surprising to find that all of the data presented were on machine design and on the effect on the plastic body.

Three plants were visited where de-airing machines were used on ungrogged bodies, and all were enthusiastic over the improvement in the resulting material, both in the plastic and fired states.

J. W. Akam[1] of the National Fireproofing Company of Canada states that the average effect of de-airing on the physical properties of various types of fired clays that he tested is as follows:

Absorption	Decreased	3%
Specific gravity	Increased	4%
Linear shrinkage	"	75%
Modulus of elasticity	"	75%
Modulus of rupture	"	20%
Ultimate strength	"	20%

All of these results are improvements, except possibly the increase in shrinkage. These same

* Presented at the Annual Meeting, American Ceramic Society, Cincinnati, Ohio, February, 1934 (Terra Cotta Division). Received February 14, 1934.

[1] J. W. Akam, "Effect of De-Airing Clay Bodies by Evacuation," *Brit. Clayworker*, **42** [500], 273–74 (1933); *Ceram. Abs.*, **13** [4], 89 (1934).

results would materially improve a terra cotta body.

The excellent investigation by Everhart, Austin, and Rueckel of the Engineering Experiment Station of Ohio State University, records the following changes due to evacuation of the clays used:

Absorption: reduction 1/2 to 5%
Linear shrinkage: only slight changes, some higher and some lower
Modulus of elasticity: increases in all cases
Modulus of rupture: generally increased
Crushing strength: increase of 4.14 to 33.6%

As to firing conditions, they state that the "use of evacuated material presents two possibilities to the manufacturers: (1) to fire to the same temperature and produce a stronger and less absorbent ware; and (2) to fire to a lower temperature and yet to give the same properties to the ware, thus effecting a saving in fuel, turnover, overhead, etc."

All of the above results are based on the use of ungrogged clays or bodies.

Records made by our company on a grogged body prepared by the de-airing process and compared with our regular unevacuated mixture show the following results: Dry modulus of rupture increased 5%; fired modulus of rupture increased 4%; total shrinkage, no change; warpage reduced 20%; and absorption reduced 2%. This indicates a decided improvement in all of these properties.

The writer hopes that these data will stimulate further work on this subject among those who are fortunate enough to have de-airing equipment. Particular attention is directed to any change in the modulus of elasticity of the fired body and also its resistance to thermal shock, freezing, and autoclave treatment.

Federal Seaboard Terra Cotta Corporation
Woodbridge, New Jersey

DE-AIRING PROCESS FOR SEWER-PIPE AND CONDUIT MANUFACTURE*

By Robert C. Zehm

ABSTRACT

Problems relative to the adaption of de-airing to sewer-pipe manufacture are discussed. A general description of equipment required for a de-airing process is outlined and a method of operation is given. Advantages of producing de-aired sewer pipe and conduits are indicated.

I. Introduction

One of the major problems encountered in the application of de-airing equipment to a sewer-pipe press is to maintain the present speed of press operation. During the time clay is being charged into the mud cylinder of the press, production is to some extent held up. In modern practice the time required to fill the mud cylinder with a charge of clay is a minimum of a few seconds. Therefore, clay is fed to a press at a tonnage rate per hour far in excess of the actual tonnage production of the press.

Preparation of the pugged clay so that it can be readily and properly de-aired is an item which should not require excessive operating power or investment in equipment. An efficient and economical method for producing de-aired sewer pipe and conduits should bring improved quality of the product and a possible reduction in operating costs.

Production of a de-aired product should reduce lamination and die troubles, eliminate blistering, increase strength of product, decrease absorption, require less fuel per ton of ware, and permit other advantages and operating economies.

This process is primarily developed for use on existing presses, is adaptable to the present standard method of press operation, and is designed to require a minimum of additional equipment which has a low operating and maintenance cost.

Plans are being made for a new press which includes de-airing equipment as an integral part of the press.

II. Equipment Required

This process as applied to existing presses, either steam or hydraulic, used for the manufacture of sewer pipe, conduits, and similar products, requires the following equipment and additional parts:

(1) A new type bottom cylinder head between the steam or hydraulic cylinder and the mud cylinder, which is completely housed in, so that a

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* Presented at the Annual Meeting, American Ceramic Society, Pittsburgh, Pa., February, 1933 (Materials and Equipment Division).

vacuum of 25 to 27 inches or more can be developed in that part of the press between the steam or hydraulic cylinder and the mud cylinder and also in the mud cylinder.

(2) A kick-off lever casting and lever which is bolted to a cover plate and used to stop the upward motion of the piston automatically.

(3) A quick opening air-relief valve attached to the cover plate by a welded pipe connection.

(4) A steam jet ejector for creating a vacuum of 25 to 27 inches in approximately 10 seconds. This ejector is attached to the kick-off lever cover plate by welded pipe connection with inside projecting hood to prevent small particles of clay from getting into the steam jet ejector.

(5) A door through which the clay is fed, swinging on hinges or sliding into position against a flexible rubber gasket, so that the weight of the door tends to keep it closed.

(6) Two General Electric thrustors for operating the air-relief valve and the feed door. If desired, both the feed door and the air-relief valve can be operated by hand control levers.

(7) One clay shredder which has been found satisfactory for tearing apart and breaking down pugged clay into small particles.

(8) Incidental equipment, such as vacuum gage, etc.

III. Operating Data

(1) Steam Consumption The steam ejector requires about 750 pounds of steam per hour at a pressure of 100 to 150 pounds to develop the desired vacuum. This represents an increase of approximately 3% in the present requirements of steam-press operation.

(2) Power Requirements The clay shredder for breaking down and tearing apart pugged clay requires a 15 h.p. motor or equivalent power for a production of 12 to 14 tons per hour, and a 20 h.p. motor or equivalent power for a production of 18 to 21 tons per hour. The G. E. thrustors require only fractional horse power and can be operated from the light circuit.

(3) Men Required No extra help is required for the operation of this de-airing process.

IV. Press Operation

The clay shredder, which provides a means of breaking down into small particles (approximately 1/4 inch and smaller) the clay from the wet pans or pugging equipment, is to be installed between the pugging equipment and the press at a point most convenient for such practice, preferably at the discharge of the clay from the wet-clay elevators, which would allow the clay shredder to discharge shredded clay on to the storage conveyer. The breaking down and tearing apart of the pugged clay permits air removal more readily from the clay by vacuum.

The position of the flying feeder must be changed so that it will discharge clay into the press at a point higher than that used in present practice.

When operating the press, steam is permitted to flow through the ejector which is connected to the bottom cylinder head (or that part of the press between the steam cylinder and the mud cylinder), thereby creating a vacuum in the enclosed space above the mud cylinder.

The air-relief valve is also connected to the bottom cylinder head and, when opened, permits air to rush into the enclosed space above the mud cylinder. The admission of this air reduces the vacuum and allows the opening of the door through which the clay is fed into the press.

The clay is fed through the door at a time when the mud head is in the mud cylinder compressing clay by the downward action. After the proper amount of clay has been fed into the press the door and the air-relief valve are closed. A vacuum of 25 to 27 inches of mercury is then created in the enclosed space above the mud cylinder. This vacuum is developed in approximately 10 seconds at a time when the mud head is working in the mud cylinder. The vacuum is maintained until the mud head is raised, the clay drops from around the piston rod and mud head into the mud cylinder, and until the mud head again enters the mud cylinder for the purpose of compressing clay and forming ware. At this time the air-relief valve and door are opened, and clay is fed from the storage conveyer on to the flying feeder, which discharges the clay through the door in the press. The air-relief valve and door are then closed and a vacuum is again developed.

This cycle of operation is repeated throughout the time the press is operated.

By the use of G. E. thrustors and a contact switch which are connected to the hand-operated clutch lever of the storage conveyer, the opening and closing of the valve and door can be regu-

lated by the movement of the storage conveyer, so that the operation of the storage conveyer, the flying feeder, the quick opening valve, and the door will be properly synchronized. If desired, the quick opening air-relief valve and the feed door can be operated with a lever arrangement by the workman who attends to the feeding of the press.

THE STEVENSON COMPANY
WELLSVILLE, OHIO

PROGRESS IN THE COMMERCIAL DEVELOPMENT OF KYANITE IN THE SOUTH ATLANTIC STATES*

BY V. L. MATTSON

I. Introduction

The use of kyanite as a refractory raw material is a comparatively recent development. Since the World War small amounts of the three mullite-forming minerals, andalusite, kyanite, and sillimanite, have been used in special refractories. Many of the technical difficulties that were encountered in using kyanite in refractory bodies have been overcome through extended laboratory investigations. The principal barrier to the more general use of kyanite in high aluminous refractories appears to be the item of cost. Cost is normally dependent upon availability of supply. It is the purpose of this paper to review some of the factors relating to the supply of commercial quantities of kyanite from the South Atlantic states.

II. Geologic Occurrence

As is the case with nearly all minerals except certain sedimentary deposits, kyanite occurs closely associated with other minerals. These associations make possible a simple classification of the deposits occurring in the South Atlantic states. One group includes all those deposits in which kyanite occurs as fairly pure lenses or masses in quartz and pegmatite veins. The other group includes the disseminated deposits in which kyanite in relatively small crystals is more or less uniformly distributed through large masses of acidic metamorphic rock.

The first type of deposit caught the attention of most of the early investigators. The kyanite lenses occurring in the pegmatite veins are usually composed of large bluish white crystals. Muscovite, quartz, feldspar, and graphite are usually present in varying amounts in these lenses. It is often difficult to judge the percentage of kyanite in a hand specimen from this type of deposit. The percentage of the large flat-bladed kyanite crystals in a given sample will almost always be overestimated in spite of their relatively high specific gravity. These masses are usually somewhat rounded and part easily from the enclosing rock, and it is possible to obtain fairly pure kyanite by hand sorting from the massive type of deposit.

These ball-like masses of kyanite are much more resistant to weathering than the other minerals occurring in the pegmatite veins; it is not uncommon to find them scattered through the soil hundreds of feet away from their original source. This has led many inexperienced prospectors to the conclusion that entire fields were underlain with kyanite, whereas actually one small lens may have been the source of all of their discoveries.

Several carloads of massive kyanite of the variety just described have been shipped from various points in North Carolina and Georgia for use in refractory products. Deposits of this type, however, are not likely to develop into important commercial sources of supply. The lenses referred to are seldom over ten feet in length and three or four feet in width. A single lens containing as much as twenty tons of high-grade ore is an exception. Variation in the associated minerals makes it difficult to assemble a shipment from several deposits that will have a uniform composition. Lack of uniformity and uncertainty of supply appear to be serious obstacles to the development of the massive type of deposit.

The disseminated type of kyanite deposit has not been of interest to the prospector-miner because of the impossibility of making a salable product by hand sorting. The first attempt to produce a concentrate from this type of deposit

* Presented at a joint meeting of the Electrochemical Society and the American Ceramic Society, Asheville, N. C., April 27, 1934. Received May 9, 1934.

was made by the McLanahan-Watkins Company of Charlotte Court House, Virginia. A small mill is now in operation at Burnsville, N. C., by Celo Mines, Inc., and a plant has been erected in north Georgia for concentrating kyanite from the soil formed by the decomposition of a disseminated deposit.

The disseminated deposits vary considerably in mineral composition, but are alike in that the kyanite is quite uniformly distributed through the recrystallized rocks of Cambrian or older age. The kyanite appears to bear no relation to the later pegmatites that are intrusive into these older rocks.

The McLanahan-Watkins deposit near Pamplin, Va., consists of friable quartzite through which crystals of kyanite and small amounts of rutile and pyrite are disseminated. In North Carolina the Black Mountain range, extending from the town of Black Mountain to Burnsville, contains numerous bands of kyanite-bearing gneiss. The mineral composition of this rock varies somewhat, but it is essentially a quartz-biotite gneiss. The deposit of Celo Mines is located at the extreme north end of the Black Mountain Range. Here a huge cigar-shaped deposit in the Carolina gneiss is being developed. Channel sampling has developed an average width of 250 feet, and a length of nearly 2000 feet is indicated with a vertical face of 135 feet exposed. A dip of 77° indicates continuity of the deposit with depth.

About twenty miles from Burnsville, in a small area of Carolina gneiss surrounded by granite, kyanite occurs in a mica schist. Kyanite is also found disseminated through mica schists at several points in the vicinity of the Nantahala National Forest. In Transylvania County, some development work has been done on a deposit composed almost entirely of kyanite and garnet.

III. Concentration

The concentration of kyanite from the massive or pegmatite types of deposit would not be difficult. The kyanite crystals are, as a whole, large and free from inclusions, and the associated minerals in most cases have a decidedly lower specific gravity than the kyanite. The uncertainty of supply of ore of this type, however, has not made it feasible to erect even a custom mill for treating the product of several small mines.

The disseminated kyanite ores present interesting problems in concentration. The mineral composition of a given ore and the maximum grain size at which the kyanite crystals separate freely from the gangue are the two important factors determining the method of concentration to be employed. The grain size of the original kyanite crystal is not always the factor determining the size to which the ore must be ground before separation can be effected. Replacement of kyanite within the crystals by quartz, muscovite, and talc has been observed. Interstitial quartz will cause kyanite crystals to behave abnormally upon heating. When this condition exists, finer grinding is necessary to effect a clean separation. In the disseminated deposits of the South Atlantic area that have been developed, grinding to at least 10-mesh is necessary to obtain concentrate free from attachments. In some of the deposits examined by the writer, it is doubtful if clean separation could be made at 100-mesh.

As most of the disseminated ores are fairly complex, there are but few instances in which a single stage of concentration will produce a clean product.

Tabling has been fairly successful in treating the washed ore from the quartzite at Charlotte Court House, but the problem of separating the kyanite from rutile and pyrite is a difficult one for a concentrating table even at fairly coarse grain sizes.

The newly developed, induction type, magnetic separators have been of great value in removing a number of the very faintly magnetic minerals.

Experimental work with flotation indicates that a definite separation of quartz and kyanite is possible. Where other minerals are present, serious difficulties appear.

Various methods of hindered settling, using both air and water, have been used with indifferent results.

The simple process of screening invariably results in a concentration of kyanite on the coarser screens. The long, narrow blades of kyanite tend to bridge the screen openings, while the more or less spherical particles of quartz tend to pass through them.

Celo Mines at Burnsville, N. C., is employing a combination of induction electromagnetic and electrostatic separation. The ore as mined contains kyanite, quartz, biotite, muscovite, garnet, and small amounts of feldspar, apatite, beryl, and mixed sulfides. After grinding to 20-mesh, the

ore is carefully sized and passed over a three-pole induction-type magnetic separator. This machine removes abraded iron, sulfides, garnet, biotite, and a large proportion of the muscovite.

Electrostatic separators of a modified Huff type are used to remove quartz, feldspar, apatite, beryl, and the remaining muscovite. A chemical analysis of a given kyanite ore or concentrate is of little value unless it is converted to a mineralogical analysis. Celo Mines uses the heavy liquid, methylene iodide, for determining the kyanite content of mill feed. In this liquid only kyanite and the magnetic minerals sink. These are readily separated with a small high-intensity magnet. Specific gravity determinations are made at frequent intervals to insure uniformity of the concentrate. With careful plant control, it is possible to make commercial quantities of concentrate in this manner which contain over 98% kyanite.

IV. Calcination

Kyanite in lump form is usually calcined by stacking the irregular-shaped masses in specially designed, circular kilns. It is, of course, impossible to calcine a granular concentrate in this manner. Celo Mines is using a small oil-fired rotary kiln for this purpose. It is necessary to run the kiln at a steep angle to offset the tendency of the oil-flame blast to carry the finer particles through the stack. The kiln now in use at Celo Mines is for experimental purposes only, and has a capacity of about one ton per 24 hours.

V. Conclusions

In summarizing the progress that has been made in the commercial development of kyanite in the South Atlantic states, the following points appear important:

(1) Commercial production will most likely develop from the disseminated types of deposit rather than from the massive or pocket deposits.

(2) Uncalcined kyanite of high quality will probably not be available in grain sizes much coarser than 10-mesh.

(3) Sufficient development work has been done on the kyanite deposits of the South Atlantic states to insure an adequate supply of this raw material.

Celo Mines, Inc.
Burnsville, N. C.

THE MYSTICAL NUMBER "76"

By F. W. Preston

In the thermal-shock tests of bottles, the practices of various bottle-making firms differ somewhat. At the recommendation of the Hartford-Empire Company, apparently, a number of firms used a thermal difference of 76°F. Various figures from 70 to 80°F, or higher at times, are used, and sometimes tests are conducted at both 70° and 80°. The purpose of the tests is primarily plant control, not a working test of the product. That is, the test is concerned with the functioning of the tank, not the functioning of the bottle.

Theoretically, there is some latitude from 70 to 110° at which the test can be conducted: at 70° very few break; at 110° very few remain unbroken, if the polariscopic examination shows little color. Tests around 80 to 90° normally give the most sensitive indications of changes of tank condition. But at 90° the test becomes difficult on account of its very sensitiveness. An error of 1° in the temperature changes the percentage broken by a serious amount. A second or two delay in the transfer from the hot to the cold bath may also produce serious errors. Constant checking of thermometers and other conditions would be necessary.

A test of 80°F or lower, therefore, seems most practical. The percentage breaking is normally not high, but is not normally zero. Thus a variation in tank conditions, if serious, will affect the percentage breaking. The test is sensitive enough without being impractically sensitive.

This does not explain entirely the use of 76° as a standard of sorts. As a matter of fact, it is not a standard in any ordinary sense of the word, but a number of firms use it. Why was 76° chosen rather than 75°? We have failed to find any one who knows the answer. It is possible that 75° is a "round figure" which might induce operators to believe it could vary a couple of degrees and not matter much, and the use of 76° tends to encourage exactness. But if any one knows the history of the mystical number, let him now speak.

Butler, Pa.

ACTIVITIES OF THE SOCIETY

Officers of the Industrial Divisions

L. E. Barringer, Charles Harder	Art	R. C. Meeker, H. B. DuBois	Materials and Equipment	J. L. Carruthers, D. A. Moulton	Structural Clay Products
W. N. Harrison, B. J. Sweo	Enamel	H. E. White, R. E. Birch	Refractories	H. D. Callahan, H. E. Davis	Terra Cotta
James Bailey, F. C. Flint	Glass			Edward Schramm, T. A. Klinefelter	White Wares

CAROTHERS IS NEW GENERAL CHAIRMAN OF THE MEMBERSHIP COMMITTEE

Plans to Take Us Sailing on the Good Ship Ceramics Down Progress River

R. B. Carothers of the H. C. Spinks Clay Co., newly appointed General Chairman of the Membership Committee, has laid out plans for an intensive drive to get new members for the Society and new advertisers for *The Bulletin*.

Appropriate introduction to this campaign is the following song composed by General Chairman Carothers:

If you know something that you want to tell,
Gonna raise a ruckus tonight
Don't sit around and crab and yell,
Gonna raise a ruckus tonight.
Get a twelve-time ad in the Bulletin
Gonna raise a ruckus tonight.
And watch it drive those orders in,
Gonna raise a ruckus tonight.

Get on board, little children,
Get on board, little children,
While the moon is shinin' bright.
And we'll go floatin' down the river,
Floatin' down the river
Gonna raise a ruckus tonight.

GET ON BOARD—the rates are low. You can't choose a better way to reach your customers and to build up good-will for your company and your product. You and your customers are members of the American Ceramic Society, and your ad will help insure the financial success of the American Ceramic Society which is of vital importance to the Industry you sell.

GET ON BOARD—Send the office your twelve-time contract.

The Membership and Advertising Committee

Membership Workers' Record

Personal	
E. K. Koos	2
Office	2
Total	4
Corporations	
F. C. Flint	1
R. B. Carothers	1
Total	2
Grand Total	6

NEW MEMBERS

Personal

Anderson, Rupert C., 408 High St., Clarksburg, W. Va.; Ceramic Engineer, D. E. McNicol Pottery Co.

Carbeau, Charles W., Ellwood Co., Ellwood City, Pa.

Finck, Joseph L., 1713 K Street, N.W., Washington, D. C.; Director, J. L. Finck Laboratories.

Long, J. Sherman, P. O. Box 283, Nutter Fort (Clarksburg), W. Va.; Foreman, Decorating Dept., D. E. McNicol Pottery Co.

Corporations

Kentucky Clay Mining Co., W. J. Watkins (voter), Mayfield, Ky.

National Lime & Stone Co., L. G. Love (voter), First National Building, Findlay, Ohio.

ROSTER CHANGES FOR AUGUST*

Personal

Bellamy, Harry T., 2757 Asbury Ave., Evanston, Ill. (Chicago, Ill.)

Callinan, Edward E., Research Dept., Timken Steel and Tube Co., Canton, Ohio. (E. J. Lavino and Co., Philadelphia, Pa.)

Cole, Sandford S., 7 West St., Hornell, N. Y. (State College, Pa.)

Duvall, Wayne H., Apt. 412, 130 N. Parkside, Chicago, Ill. (Urbana, Ill.)

Gibson, Frank G., Magdalena Fruit Co., Santa Marta, Rep. of Colombia, S. A. (Canton, Ohio.)

Henderson, Frank P., San Jose Potteries, Monterrey, N. L., Mexico. (San Antonio, Texas.)

Herold, Paul G., A C Spark Plug Co., Flint, Mich. (Columbus, Ohio.)

Langenbeck, Karl, 2501 Kemper Lane, Cincinnati, Ohio. (Washington, D. C.)

Larkin, Paul G., 345 E. San Antonio, Apt. 2, San Jose, Calif. (South Pasadena, Calif.)

Mellor, J. W., The Mellor Laboratories, Shelton, Stoke-on-Trent, England. (Regent St.)

Miller, John B., 1123 Roselle Ave., Niagara Falls, N. Y. (Cleveland Heights, Ohio.)

Pincus, Alexis, P. O. Box 181, Hamburg, N. Y. (Rutgers University, New Brunswick, N. J.)

Richardson, Robert, P. O. Box 222, Laurens, S. C. (Babcock and Wilcox Co., Augusta, Ga.)

Skinner, Kenneth G., Universal Gypsum and Lime Co., York, Pa. (Univ. of Washington, Seattle, Wash.)

Sosey, LeRoy K., Seegar Mfg. Co., St. Paul, Minn. (Columbus, Ohio.)

Zehm, Robert C., 2734 Norwood Ave., Norwood, Ohio. (Stevenson Co., Wellsville, Ohio.)

* The former address is in parentheses.

WATCH THEM GET ON BOARD

Year	Paid Members			New Members to August 1		
	Personal	Corporation	Total	Personal	Corporation	Total
1933 Whole Year	1184	148	1332	55	2	57
1934 to Aug. 1	1166	159	1325	117	9	126
1934 to Aug. 28	1178	163	1341	122	11	133

	Aug. 1	Aug. 28
1934 Paid Members	1325	1341
1934 Subscribers	419	426
Average Current Sales	100	100
Deferred Payment Members	58	49
PRESENT CIRCULATION	1902	1916

COLLEGIATE CERAMIC MEETINGS VALUABLE

Three valuable meetings are scheduled for this fall at ceramic schools, (1) Penn State, October 5 and 6, (2) Conference on problems of glass technology at the University of Illinois, November 2 and 3, and (3) the annual meeting of the Ohio Ceramic Industries Association at Ohio State University, November 16 and 17.

In December the Ceramic Association of New Jersey will hold its annual meeting.

The state meetings at Universities are positive factors in the promotion of ceramic arts and science. It is for this reason that the American Ceramic Society is deeply interested in these meetings.

In our university ceramic departments we have not only the educational training of youths on whom, in days to come, will be the burden of advancing the ceramic arts and science industrially, but in these schools we have laboratories and research staffs which are available to the public for finding factual means by which ware may be improved and production costs decreased.

These schools must have direct contacts and carefully studied purposes. They are maintained at public expense for the benefit of the public. The benefits which accrue, however, will be most largely for those who contact with these schools and give aid in determining the investigations.

These meetings at ceramic schools this Fall merit support and attendance.

PITTSBURGH SECTION TO MEET AT STATE COLLEGE OCTOBER 5 AND 6

Inspired by the success of the meeting last fall, the Pittsburgh Section plans to open the coming season by meeting again at State College, Pa., in coöperation with the Penn State Ceramics Department. A splendid program has been arranged by Nelson W. Taylor, Head of the Department of Ceramics at Pennsylvania State College. Centering around the general theme, "Colloid Problems in Ceramics," a series of papers will be presented by well-qualified speakers on widely different applications of colloidal studies. Presentation of papers will occupy the afternoon of October 5 and morning of October 6.

Program for Technical Sessions

(1) "Progress in Soil Technology Resulting from Colloid Studies." Richard Bradfield, Professor of Agronomy, Ohio State University.

(2) "Problems in the Utilization of Pennsylvania Fire Clays." Fred A. Harvey, Director of Research, Harbison-Walker Refractories Co.

(3) "Principles and Practice of Casting Refractory Shapes." Gordon Klein, Ceramic Engineer, New Castle Refractories Co.

(4) "Some Observations on Casting Clayware." T. A. Klinefelter, Ceramic Engineer, U. S. Bureau of Standards.

(5) "Plastic Flow in Nearly Dry Clay Bodies." Harry Thiemecke, Homer Laughlin China Co.

(6) "Modern Methods for Determination of Fine Particle Sizes." J. A. Wagner, U. S. Bureau of Standards.

(7) "Metal Decoration for Ceramic Ware." J. H. Young, E. I. du Pont de Nemours & Co., Inc.

WHOM DOES THE AMERICAN CERAMIC SOCIETY BENEFIT?

Secretary Purdy's Answer to This Challenging Question[1]

The Letter

(1) "Most of my friends in the glass industry are already subscribers to your Society and those that are not are not because there is no one in their organization capable of understanding and profiting by the *Journal*, which goes over their heads. I should not feel justified in urging membership upon individuals or corporations in this fix."

(2) "It appears to me that the proper people to support the Society are those who benefit from it rather than those who do the work."[2]

The Reply

(1) It is my belief and creed that if the American

[1] August 2, 1934.

[2] From a letter to the Secretary, received July 29, 1934.

Ceramic Society benefited only those who can read the scientific and technical literature published by the Society, the Society had better disband—quit. If the original research reports published in the *Journal* and if the *Ceramic Abstracts* were not of lasting value to each ceramic ware, ceramic material, and ceramic equipment concern, the money and effort now being expended would, in my opinion, be a wastage.

I pay dues in an automobile association, in a Chamber of Commerce, into fraternal organizations, technical and scientific societies, and into civic and school organizations, even $15.00 per month to a church with no participation in its "doings," the only benefits accruing being advancement of general welfare in which I indirectly participate. These are taxes. It pays bachelors and old maids to support schools in which their associates are educated.

Importance of Publications

Far more directly and to a much larger extent do ceramic corporations benefit from the *activities* of the American Ceramic Society, including publications, than they do from the activities of any other educational or general welfare organizations. Should the American Ceramic Society merely hold its meetings and have its several committees functioning, and not publish anything, still it would pay each and every corporation to finance such activities to the extent of at least the minimum annual corporation fee of $25.00.

I can not view publications as the end-purpose or the major task of this Society. The *Journal*, *Ceramic Abstracts*, and *The Bulletin* are, in my opinion, merely working tools by which the Society promotes the ceramic arts, science, and technology through research and educational activities.

Corporations' Debt to Society

If the benefits which accrue to every ceramic corporation are not worth to them $25.00 minimum annual fee asked of them no matter whether they can or do or care to read the publications issued, I would say that the Society was not worth while.

Furthermore, if each corporation would today pay in support of the Society's activities a "retroactive" fee of thirty-five times $25 or $875, and for thirty-five years in advance they would not fully pay for the benefits which they have already received.

Having the scientific and technological benefits translated and applied by sales and engineering representatives of material and equipment concerns does not lessen their selfish obligation to make this provocative source of ceramic information just as virile and productive as it can be. They owe it to themselves to invest this minimum of $25.00 each year in the activities of the American Ceramic Society. This is not altruism but downright business investment. In fact, if each ceramic corporation would do full justice to itself it would put the American Ceramic Society on its monthly pay roll, *in absentia* though it might be to many of them.

Value of Participation

(2) Now as to who benefit most largely: Why, those who participate most largely. It would not be an injustice to charge a fee for the privilege of participating in the Meeting program and in the publications. Anyhow, that is my Scotch-Irish idea and belief. I know from personal experience that it costs money and effort to prepare a paper for the Society, but I also know that the one who benefits most largely from each paper presented and published is the author, wholly from the effort made and the codified thinking required.

Why "Hep It Up" for a Larger Support?[3]

We are not hiding the fact that this Society must be more largely supported if it is to continue serving the ceramic industry to any such extent as it has in the immediate past, and especially if it is to serve to the fullest extent of the opportunities which are being pressed upon it. This financial support must come through increased membership and increased advertising.

Excellent Advertising Medium

If we did not believe that in *The Bulletin* the materials and equipment people have a sales medium equal to any that is available to them we would not ask them to purchase space. In addition to being an excellent sales medium, they would be advancing their own welfare as well as that of their prospective customers by thus supporting the Society and making possible the publication of the large number of research reports which the Society has on hand and available for publication.

Value of Abstracts and Index

Our monthly abstracts of the world's ceramic literature and our Annual Index of the same constitute a library service of incalculable value not only to producers of ceramic ware but also to producers of ceramic materials and equipment. This service must not be curtailed. It should and can be expanded. The extent of the service thus rendered will depend entirely upon the support received through Personal and Corporation Memberships and the purchase of advertising space.

What the Society Does

For thirty-five years this Society has promoted ceramic education and research, and publications of original researches have been simply a working tool and not the end purpose of the Society. Should publications be the sole or main purpose of the Society it would soon lose the earnest support which many are giving to it. I, for one, would not be interested in the Society as a publication medium.

The big province of the Society is to promote ceramic researches and education. This the Society has in the past done by helping prepare a bill instituting a Ceramic Department in the Bureau of Mines and Bureau of Standards, by promoting ceramic education and research in state universities, and by collaborating in every ceramic research and educational activity. Our work with the state

[3] Letter to another member.

geological surveys has done much to make information available regarding ceramic materials.

Many Activities of the Society

This account would be too long should I recite all the activities in which this Society has engaged, and of which the research reports which constitute our Annual Meeting programs and the contents of our *Journal* are the direct results.

Without the organized promotion of ceramic education and research these research reports would not be available for publication. The reports are merely evidence of results of the real purpose and activities of the Society.

Whom Does the Society Benefit?

Thus far this year, we have averaged $32^2/_3$ pages in the *Journal* and $24^1/_3$ pages in *Ceramic Abstracts*. We have reduced the pages in the September *Journal* to twenty-four even though we had 78 pages set up and available for September. Our September *Abstracts* are low. Only by an increase in funds can we print an October *Journal*. We are able to pay for the July, August, and September *Journals* and *Abstracts* only by cashing some of our reserves.

It would cost our entire reserve to carry on in keeping with the opportunities which we have. We are more interested in the future than in the past or present. We must have a larger income.

Who Should Carry the Cost Burden?[4]

While it is through and by the technical men in ceramics that the results of the activities of the Society are translated, yet the benefits accrue to all ceramic persons and corporations. Should this Society be operated only with the technical men in ceramics as the intended beneficiaries, we should be unmindful of the purpose of this Society, that of "promoting the ceramic arts, science, and technology." Corporations, even those without technical men in their employ, are asked not for altruistic purposes to support this Society but rather in the interest of their material welfare.

It would, it seems to me, be too bad if the cost burden of this Society should be carried alone by the technical employees.

[4] Addressed to a third member.

STRAIGHT BOOSTS SYMPOSIUM ON CONTROLLED THERMAL HISTORY FOR CERAMIC WARES

H. R. Straight of the Adel Clay Products Company writes that he will work out a program of research at Ames with Paul E. Cox for the Fall Quarter in the Ceramics Department and attempt to determine the influence of thermal history on Iowa clays. This material will be presented at the Annual Meeting.

Mr. Straight is in close touch with Dr. Jenning, who is head of the Physical Chemistry Department at Iowa State College and is an X-ray expert. Mr. Straight hopes to interest him in making X-ray determinations of the changes in the crystal structure with different heat treatments.

He also plans to interest the Iowa clayworkers in asking that a project be made of this work at Ames with some money behind it to carry on the work.

The importance of this subject as a general topic of papers at the next Annual Meeting can not be overestimated, for the saving in coal with proper heat control at proper times is vital as regards the coal required to attain proper vitrification. A difference of over 25% of the coal is experienced at times in different plants and to only a few is the reason even vaguely apparent.

Program Chairman George H. Brown Issues Call

Editorials and correspondence have appeared in *The Bulletin* to create a thoughtful consideration of the purposes and the requirements involved in the firing of ceramic ware. The August issue of *The Bulletin* concluded the series of editorials by the Editor. We hope the society members will develop this subject further in *The Bulletin*.

Please also read in the July issue of *The Bulletin* the editorial, Mr. Lovejoy's paper, the correspondence with Mr. Hepburn, and the letters from Messrs. Lovejoy and Straight.

We want to have a Symposium next February at our Annual Meeting. You will aid me by suggesting topics to be discussed, and by naming persons who have observations and experiences that would qualify them to discuss subjects pertinent to this symposium topic.

It is desired to develop a knowledge of how uniformly each of the ceramic wares should be fired, how to obtain for each the required uniform thermal history, and how to determine the exactitude of results obtained.

Your coöperation in developing this important subject is very much desired. Please send me your suggestions.

G. H. BROWN, *Chairman*,
Program Committee,
Materials & Equipment Division.

YOUNGEST MEMBER NOW ON BOARD CAPTAIN DICK'S SHIP CERAMICS

William Keith McAfee, Jr., weighing 7 pounds 13 ounces, 20 inches long, was born August 20, 1934, while his daddy was attending a code meeting. Katherine, his mother, is doing well.

Congratulations, Mr. President! Your scheme for increasing our membership is unique. Not all of us can follow suit but we'll do our bit in such ways as we can!

CALIFORNIA SECTION HOLDS SUMMER SOCIAL AND BEER BUST

The California Local Section met for dinner July 12 at a social session which was enlivened by entertainment engineered by B. M. Burchfiel, assisted by Ben Berg, Leslie Sample, and their energetic chairman, A. Lee Bennett. The event attracted widespread attention and scores of telegrams were received during the evening including one from the General Secretary, Ross Purdy, stating that the crowd was making too much noise and to "pipe down."

This meeting climaxed a year of unparalleled activity on the part of the California Section and resulted in a feeling of much closer acquaintanceship among the members. TOM CURTIS, *Secretary*

NOTES AND NEWS

SECOND CONFERENCE ON GLASS PROBLEMS NOVEMBER 2 AND 3

The Department of Ceramic Engineering of the University of Illinois announces that in response to numerous requests, a second Conference on Problems of Glass Technology will be held in Urbana on Friday and Saturday, November 2 and 3. As a side attraction, the football game between the Army and the University teams is scheduled for the afternoon of November 3.

SHAW DIRECTS CERAMIC RESEARCH IN CHINA

T. H. Shaw, graduate of the Massachusetts Institute of Technology, states in a recent letter that he is Director of the Laboratory of Ceramic Research in China.

Fifty men are at the present time working on research problems under his direction, according to the letter. He is also in charge of a school for teaching the arts and sciences of Ceramics, which is located in Kinkiang. Three hundred students attend this school.

WORLD'S OLDEST GLASS COLLECTION SHOWN AT FAIR

The world's oldest collection of antique bottles and glassware, some of the specimens thirty centuries old, have been placed on display at the Owens-Illinois glass block building, Century of Progress Exposition, Chicago.

This collection of antiques belongs to the Toledo Museum of Art and originally was obtained from all parts of the world at tremendous cost by the late Edward Drummond Libbey, who, with Michael J. Owens, made possible the machine blowing of glass 34 years ago.

Several of the bottles in the collection were made before the invention of the blow pipe in 300 B.C., while one ewer shown was made by the Egyptians in 600 B.C. These bottles are colored in various hues due to age and decay caused by the chemical action of moist alkaline earth on the glass. The collection contains drinking cups or goblets, bowls of all sizes, bottles, jugs, and vases used by the ancients.

Glassmaking was the first industry established on the American continent. Many of the earliest American examples are in the collection, besides "ruby" or Bohemian Glass produced by the Germans and "milk" glass produced by Europeans in the early part of the 19th Century in an effort to find a substitute for Oriental porcelain.

CERAMIC TECHNOLOGY COURSES 10 YEARS OLD AT BENARES HINDU UNIVERSITY

The pottery, porcelain, and metal enameling courses, started in 1924 at Benares Hindu University in the department of industrial chemistry, are now designed for degree and diploma students who plan to enter the industry as manufacturers, managers, chemists, or foremen, an announcement from the school states. Comprehensive training in the scientific and technical principles of the various branches of ceramics is given. This included practical training in the use of machines and appliances for the production of ceramic ware. The model factory in the department provides for training in factory methods.

The laboratories, fitted for up-to-date analytical work, accommodate forty students. Coal, oil, and electric furnaces of various designs are provided as well as means for making physical tests for tensile strength and crushing strength and pyrometers for measuring high temperatures.

Students from Kashmir, the Punjab, Bengal, Bombay, Madras, Mysore, Hyderabad, and Travancore are in the department. Twenty-one scholarship holders have been trained in this school, some of them securing foreign scholarships after completing their work in the department.

On a semi-commercial scale the department manufactures toys and statues of porcelain and parian bodies, earthenware, tableware, vases, tile, wash basins, and sinks. Multicolored majolica ware for decorative purposes are also produced. Manufacture of stoneware jars and electrical and chemical procelain has also been started.

H. N. Roy, former student in the department and graduate of the Technical Institute, Stoke-on-Trent, England, was sent to Benares by the Industries Department, United Provinces, to develop the red clay Rockingham pottery which is being manufactured as a cottage industry

at Khurja in District Bulandshar and at Chunar. Under his guidance the government plans to start a demonstration factory at Khurja for the ordinary potters.

Sign plates and advertisement boards in both simple and multicolored designs are manufactured in the enameling section of the department.

Glass enamels were recently produced by one of the students. This is the first time, as far as is known, that such enamels have been produced in India. These enamels formerly imported from China and Japan for the decoration of beads and bangles as well as other kinds of glassware, are now manufactured commercially at the University. This is the direct result of the research work of the last two years. Bangle manufacturers at Ferozabad and bead manufacturers at Purdalpur are using the Indian enamels increasingly. The department also manufactures liquid gold for the decoration of glass bangles.

Students from the department are at present working in many phases of the ceramic industry. The presence of the Engineering College, together with the departments of Geology, Mining, and Metallurgy makes the Benares Hindu University well-fitted to train ceramists in India. S. Dogar Singh is ceramic expert at the University.

"ALL ABOARD!" CALLS CAPTAIN DICK OF THE GOOD SHIP CERAMICS ABOUT TO SAIL UP PROGRESS RIVER

FELLOW MEMBER:

Please read carefully the list of members in the Society as published in this issue of *The Bulletin*. When you check over this list, we are sure that the names of many individuals and corporations will come to your mind as individuals and corporations that are vitally interested in the work of the American Ceramic Society yet not members.

We need the interest and guidance of these people in the work of the Society, and we need their financial support, and feel that many of them will gladly join if you will ask them to do so and explain to them the good that the Society is doing and the advantages and pleasures of being a member.

If any of these prospects that you think of turn you down, please send their names and addresses to me, at Newport, Kentucky, in order that we may solicit their support.

Thanking you in advance for a lot of members and a big list of prospects, I am,

Sincerely yours,

R. B. CAROTHERS, *Chairman*
THE MEMBERSHIP & ADVERTISING COMMITTEE

P. S.: The advertisers in *The Bulletin* are a big help to the Society financially, and *The Bulletin* is an excellent advertising medium. Please also send us some advertising contracts and prospects.

GEOGRAPHIC ROSTER OF THE AMERICAN CERAMIC SOCIETY

Charter

Charles F. Binns, Alfred, N. Y.
A. V. Bleininger, Homer Laughlin China Co., Newell, W. Va.
Stanley G. Burt, 1032 Riverside Dr., Stuart, Florida.
Wm. D. Gates, Crystal Lake, Ill.
Samuel Geijsbeek, Geijsbeek Eng. Co., 601 Artic Bldg., Seattle, Wash.
Ellis Lovejoy, 480 W. Sixth Ave., Columbus, Ohio.
Karl Langenbeck, 2501 Kemper Lane., Cincinnati, Ohio.
W. D. Richardson, 366 King Ave., Columbus, Ohio.
H. Ries, Cornell Univ., Ithaca, N. Y.
Herbert A. Wheeler, 408 Locust St., St. Louis, Mo.

Honorary

Arthur L. Day, Geophysical Laboratory, Washington, D. C.
H. Le Chatelier, Univ. of Paris, Paris, France.
J. W. Mellor, The Mellor Labs., Shelton, Stoke-on-Trent, England.
Otto Schott, Jenaer Glass Works, Jena, Germany.
W. E. S. Turner, The University, Darnall Road, Sheffield, England.

Alabama

Personal

E. J. Ladd, Southern Refractories Co., Fort Payne.
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Gerard A. Murray, Route 4, Box 651, Bessemer.
L. L. Stephenson, Jr., 4104 Clairmont Ave., Birmingham.
Samuel R. Stephenson, Stephenson Brick Co., Decatur.
James H. Varner, 445 Valley Rd., Fairfield.

Corporation

Alabama Clay Products Co., Attn. A. S. Holberg, 833–37 Martin Bldg., Birmingham.

Arizona

Personal

H. A. Rossell, Christmas.

Arkansas

Personal

Samuel J. Carnes, Camark Pottery Co., Camden.
Robert H. Ellis-Anwyl, Camark Pottery, Camden.
Leo J. Franz, Acme Brick Co., Malvern.
H. L. Winburn, 709 Ractor Bldg., Little Rock.

California

Personal

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Kenneth M. Henry, Illinois Pacific Glass Co., San Francisco.
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Fred P. Johnson, 1504 Garden Ave., Glendale.
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Glen Lukens, High School, Fullerton.
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William McClintock, Pacific Clay Products Co., 650 Chamber of Commerce Bldg., Los Angeles.
H. B. McMillen, 210 North Ave. 66, Los Angeles.
A. Malinosky, Jr., 2759 Santa Ana St., Southgate.
A. Malinovszky, 2759 Santa Ana St., Southgate.
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L. M. Richard, Route 2, Box 619, Escondido.
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Fred H. Robertson, Claycraft Potteries, 3101 San Fernando Rd., Los Angeles.
James W. Ryan, 62nd & Green Sts., Emeryville.
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Solon Shedd, Box 1888, Stanford University.
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F. E. Twining, Twining Laboratories, Fresno.
A. A. Van Cleave, 650 S. Highland Ave., Los Angeles.
L. G. Wassman, Standard Sanitary Mfg. Co., Pacific Enamel Works, Box W, Richmond.
Henry Weiss, Olympic Club, San Francisco.
O. B. Westmont, Johns-Manville Products Corp., Lompoc.
George A. Williams, N. Clark & Sons, West Alameda.
Glenn D. Williams, 863 Amherst Place, Brentwood Heights Sta., Los Angeles.
Charles D. Woodhouse, Mocalno, Mono County.
Richard C. Zapfe, Pomona Tile Co., Pomona.

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Southern Calif. Gas Co., Attn. Lee Holtz, 1700 Santa Fe Ave., Los Angeles.

Colorado

Personal

Mrs. May C. Bowen, Box 107, Cañon City.
George P. Heinz, 810 12th St., Denver.
F. J. Helwig, 2411 Elizabeth St., Pueblo.
George W. Lindsay, Denver Fire Clay Co., Denver.
R. D. Lindsay, 2066 Albron St., Denver.
Leroy Marx, Northwestern Terra Cotta Co., West First Ave. and Umatilla St., Denver.
Harold W. Ryland, 715 17th St., Golden.

Corporation

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Denver Sewer Pipe & Clay Co., Attn. Wm. J. Geddes, Broadway at Curtis, Denver.

Connecticut

Personal

Harry H. Davidson, Mullite Refractories Co., Seymour.

Charles O. Duevel, Jr., American Thermos Bottle Co., Norwich.
Dwight T. Farnham, Green Orchard, Compo Rd., Westport.
Carl H. Gross, R. D. 4, Bridgeport.
Francis N. Hastings, Hartford Faience Co., Hartford.
Harold Karthauser, 11 Connecticut Ave., Greenwich.
Frank Reuss Kelley, 69 Silvermine Ave., Norwalk.
V. Mulholland, Hartford-Empire Co., Hartford.
Karl E. Peiler, Hartford-Empire Co., Hartford.
S. J. Slaven, Mullite Refractories Co., Seymour.
Mrs. Aida Watrous Spicer, 25 Church St., Groton.
Victor C. Swicker, Hartford-Empire Co., Hartford.
Paul G. Willetts, Hartford-Empire Co., Hartford.

Corporation

Hartford-Empire Co., Attn. F. Goodwin Smith, Hartford.

Delaware

Personal

Howard H. Oberly, Oberly Brick Co., 909 Orange St., Wilmington.

Corporation

E. I. du Pont de Nemours & Co., Inc., Attn. Thomas H. McKeown, R. & H. Chemicals Dept., Wilmington.
Oberly Brick Co., Attn. Howard H. Oberly, 909 Orange St., Wilmington.

District of Columbia (Washington)

Personal

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P. H. Bates, 3835 Livingston St., N. W.
Vernon M. Dorsey, 1346 F St., N. W.
Joseph Louis Finck, J. L. Finck Lab., 1713 K St., N. W.
Alfred N. Finn, Bureau of Standards.
W. N. Harrison, Bureau of Standards.
Raymond A. Heindl, 4917 43rd St., N. W.
Herbert Insley, Bureau of Standards.
T. A. Klinefelter, 3813 Yuma St., N. W.
Gustav E. F. Lundell, Bureau of Standards.
LaVerne A. Messimer, Cement Reference Lab., Bureau of Standards.
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Jefferson Middleton, 3509 Fourteenth St., N.W.
Lewis E. Mong, 3525 Davenport St., Apt. 303.
G. R. Shelton, 3384 Stuyvesant Place.
Stephen M. Shelton, Bureau of Standards.
R. T. Stull, 3511 Davenport St., N. W., Apt. 506.
Benjamin J. Sweo, Bureau of Standards.
Arthur Q. Tool, Bureau of Standards.
Ray T. Watkins, U. S. Tariff Comm., Ceramic Div.

Florida

Personal

Charles L. Abney, Columbus Brick & Tile Co., Jacksonville.
Frank C. Westendick, State of Fla., Geological Dept., Martin Bldg., Tallahassee.

Georgia

Personal

James H. Carmichael, Babcock & Wilcox Co., Augusta.
P. M. Clark, Georgia Kaolin Co., Dry Branch.
Freeman S. Douglas, Babcock & Wilcox Co., Box 923, Augusta.
Kenneth W. Dunwody, P. O. Box 347, Cherokee Brick Co., Macon.
Victor J. Duplin, Jr., 2087 Heckle St., Augusta.
Charles F. Greene, 218 Melrose Ave., Decatur.
W. C. Hansard, 32 Huntingdon Road, Atlanta.
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Western Brick Co., Attn. F. M. Butterworth, Danville.
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J. F. Ritter, Evansville Enameling Co., Evansville.
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Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Furnace
Carborundum Co. (*Carboradiant*)
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.

G

Glaze and Body Spar
Ceramic Color & Chemical Mfg. Co.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Glazes and Enamels
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Drakenfeld & Co., B. F.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.
The Roessler & Hasslacher Chemical Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Glaze Spar
Ceramic Color & Chemical Mfg. Co.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Gold
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Grinding Wheels
Norton Co. (*Alundum Crystolon*)

H

Hearths
Carborundum Co.
(*Carbofrax* heat treating)
Norton Co. (*Crystolon*)

Hearths (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
Carborundum Co.
Norton Co.

I

Iron (Enameling)
American Rolling Mill Co.

Iron Oxide
Drakenfeld & Co., B. F.

K

Kaolin
Ceramic Color & Chemical Mfg. Co.
Edgar Brothers Co.
Hammill & Gillespie, Inc.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

(Kilns China, Decorating)
Drakenfeld & Co., B. F.

Kryolith
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

L

Leeds (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
Carborundum Co.

Linings (Furnace Refractory, Block Refractory Plate, Brick and Tile)
Carborundum Co.
Norton Co.

M

Magnesia (Sintered, Calcined)
The Exolon Co.
Norton Co.

Magnesite
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Hammill & Gillespie, Inc.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Manganese
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Hammill & Gillespie, Inc.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Metals (Porcelain Enameling)
American Rolling Mill Co.

Minerals
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Muffles (Furnace)
Carborundum Co. (*Carbofrax*)
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Norton Co.

Mullite (Artificial)
The Exolon Co.

N

Nitrates (Cobalt, Sodium)
Ceramic Color & Chemical Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

O

Opacifiers
Ceramic Color & Chemical Mfg. Co.
Metal & Thermit Corp.
Porcelain Enamel & Mfg. Co.
The Roessler & Hasslacher Chemical Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Oxides
Ceramic Color & Chemical Mfg. Co
Chicago Vitreous Enamel Product Co.
Drakenfeld & Co., B. F.
Ferro Enamel Corp.
Metal & Thermit Corp.
Porcelain Enamel & Mfg. Co.
The Roessler & Hasslacher Chemical Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

P

Pins
Potters Supply Co.

Porcelain Enameling Service (Practical)
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Porcelain Enamels
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.
The Vitro Mfg. Co.

Potash (Carbonate)
Ceramic Color & Chemical Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Pyrometer Tubes (Refractory and Hard Porcelain)
McDanel Refractory Porcelain Co.

R

Refractories
Carborundum Co.
The Exolon Co.
Norton Co.

Refractory Materials
Carborundum Co.
The Exolon Co.
Norton Co.
Titanium Alloy Mfg. Co.

Rutile
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Metal & Thermit Corp.
The Roessler & Hasslacher Chemical Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

S

Saggers
Carborundum Co.
Norton Co.
Potters Supply Co.

Selenite of Sodium
Drakenfeld & Co., B. F.
The Vitro Mfg. Co.

Selenium
Drakenfeld & Co., B. F.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Sheets (Enameling Iron)
American Rolling Mill Co.

Silica (Fused)
The Exolon Co.

Silicate of Soda
Ceramic Color & Chemical Mfg. Co.
Philadelphia Quartz Co.
The Vitro Mfg. Co.

Silicon Carbide
The Exolon Co.
Norton Co.

Silicon Carbide Firesand
The Exolon Co.

Sillimanite (Synthetic)
The Exolon Co.

Slabs (Furnace)
Carborundum Co.
Norton Co.

Smelters
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.

Soda Ash
Ceramic Color & Chemical Mfg. Co.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Sodium Antimonate
Ceramic Color & Chemical Mfg. Co.
Metal & Thermit Corp.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Sodium Fluoride
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Spar
Ceramic Color & Chemical Mfg. Co.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co
The Vitro Mfg. Co.

Spurs
Potters Supply Co.

Stilts
Potters Supply Co.

Sulphuric Acid
Drakenfeld & Co., B. F.

BUYERS' GUIDE (continued)

T

Talc
Hammill & Gillespie, Inc.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.

Tanks (Pickle)
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.

Tile (Refractory)
Carborundum Co. (*Carbofrax*)
Norton Co.

Tile (Wall)
Ferro Enamel Corp.

Tin Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Metal & Thermit Corp.
The Roessler & Hasslacher Chemical Co.
The Vitro Mfg. Co.

Titanium
Ceramic Color & Chemical Mfg. Co.
Drakenfeld & Co., B. F.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Titanium Oxide
The Roessler & Hasslacher Chemical Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Tubes (Insulating)
McDanel Refractory Porcelain Co.
Norton Co.

Tubes (Pyrometer)
McDanel Refractory Porcelain Co.
Norton Co.

W

Wet Enamel
Ceramic Color & Chemical Mfg. Co.
Chicago Vitreous Enamel Product Co.
Ferro Enamel Corp.
Porcelain Enamel & Mfg. Co.
The Vitro Mfg. Co.

Whiting
Drakenfeld & Co., B. F.
Hammill & Gillespie, Inc.
Paper Makers Importing Co.
The Roessler & Hasslacher Chemical Co.

Z

Zirconia
Ceramic Color & Chemical Mfg. Co.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

McDANEL REFRACTORY PORCELAIN COMPANY

Manufacturers of

PORCELAIN TUBES PROTECTION TUBES
INSULATING TUBING and BEADS

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HARTFORD, CONN.

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STACKERS LEHRS

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Our broad experience is at your service.

We represent the Ferro Enamel Corporation, Cleveland, Ohio, as sales agents for its complete and successful line of ceramic glazes.

ALLIED ENGINEERING COMPANY
4150 E. 56th STREET CLEVELAND, OHIO
(A SUBSIDIARY OF FERRO ENAMEL CORPORATION, CLEVELAND, O.)

Ceramic Service? We Give It

We Manufacture—

Pins
Stilts
Thimbles
Spurs
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Crucibles
Tile for Decorating Kilns

We Sell—

Ball Clay
Sagger Clay
Wad Clay
Ground Fire Clay
Bitstone
Fire Brick
Imported Paris White
Domestic Whiting

THE POTTERS SUPPLY COMPANY
EAST LIVERPOOL, OHIO

CHAMPION and CHALLENGER Ball Clays

have quickly acquired a large percentage of the Ball Clay Business.

WHY?

They have particular qualities that make possible low production costs and a better quality ware.

The facilities and mining methods of the H. C. SPINKS CLAY COMPANY insure continual shipments of shed dried, uniform CHAMPION and CHALLENGER Ball Clay for the next fifty years.

Your business is appreciated.

H. C. SPINKS CLAY COMPANY

NEWPORT, KENTUCKY

88-80, Bethlehem's new steel for the parts that get the abrasive wear in grinding and pulverizing machinery, has several features that make it ideal for this service.

Castings of 88-80 have extremely high abrasion-resistance, of course. That was the chief object in developing this new steel. But they have, in addition, the big advantage of uniformly high abrasion-resistance throughout. No relatively soft center under a hard surface. Every pound of steel you buy is good for its quota of grinding—and it's a large quota, too.

Further, the wear-resistance is uniform all the way across the face of the casting. You get no concavely-worn surfaces to reduce grinding efficiency; no too-hard corners to spall and break off; no soft spots to wear into pockets.

Every Bethlehem 88-80 Casting receives a special heat-treatment adapting the properties of the steel to the kind of material to be ground. This assures that on any job the full inherent abrasion-resistance of the steel will be realized.

When you next have to replace Muller tires, pan bottoms, crusher roll shells, or similar parts, try castings made of Bethlehem 88-80.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

District Offices: Atlanta, Baltimore, Boston, Bridgeport, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Indianapolis, Milwaukee, New York, Philadelphia, Pittsburgh, St. Louis, St. Paul, Washington, Wilkes-Barre, York. *Pacific Coast Distributor:* Pacific Coast Steel Corporation, San Francisco, Seattle, Los Angeles, Portland, Honolulu. *Export Distributor:* Bethlehem Steel Export Corporation, New York.

BETHLEHEM STEEL

BETHLEHEM 88-80 CASTINGS

SYNCROLITE

"Rutgers Brand" Synthetic Cryolite—the recognized Standard.

Always available for spot delivery.

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GUARANTEED OVER 99.5% PURE

AMERICAN POTASH & CHEMICAL CORPORATION

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Products of the Electric Furnace

SILICON CARBIDE
ARTIFICIAL MULLITE
SILICON CARBIDE FIRESAND
FUSED ALUMINUM OXIDE
FUSED MAGNESITE

Furnished in raw material form, ground to meet specifications.

Our Research Department with fully equipped laboratories is always at your service.

WRITE US ABOUT YOUR PROBLEMS

THE EXOLON COMPANY

Established 1914

Electric Furnace Plant { THOROLD, ONTARIO

Finishing Plant, General Offices { BLASDELL, N. Y.

BORDEN'S ADOPTS COLORED CREST TO INTRODUCE NEW GRADE OF MILK

•

R & H Ceramic Colors Selected for Decorating Bottles

NOVEL in the use of color on milk bottles is the brand identification — a shield supporting the profile of a cow, colored in red and gold—adopted by the Borden's Farm Products Company, Inc. to aid in introducing its new Grade A "Golden Crest" Milk to the New York market during June. The name "Borden's" also appears in color just below the shield.

The design adopted by Borden's is a distinctive advance in the use of color on milk bottles. To secure the necessary effect it was found that special ceramic colors would be required. Only colors resistant to alkali could be used to prevent fading of color when the milk bottles were washed and sterilized.

The R. & H. Chemicals Department of the du Pont Company was glad to cooperate in developing the special red and gold colors required. The colors finally selected by Borden's were prepared at the R & H Ceramic Laboratory at Perth Amboy, New Jersey, especially for this decoration problem. The colors developed are alkali resistant.

Borden's Farm Products Company, Inc. placed an initial order for 50 carloads of these bottles so that they could start off with a complete supply and also have a sufficient reserve for replacement. To date they have found that the new decorated bottle has been a strong merchandising help in introducing the new "Golden Crest" milk. The milk and the new container are being advertised to the metropolitan market through newspapers, car cards, outdoor posters, wagon posters, bottle slipovers and other mediums.

BORDEN'S FARM PRODUCTS CO INC
NEW YORK
June 11, 1934.
Mr. Thos. H. McKeown
E. I. du Pont de Nemours & Co., Inc.
The R. & H. Chemicals Dept.
Perth Amboy, N. J.
Dear Mr. McKeown:
Enclosed is our second ad following the introduction of our new Grade A "Golden Crest" Milk, which was made Thursday, June 7th. I take this opportunity of expressing our appreciation for the cooperation you have given us in working out suitable colors for this new bottle. Judging from the unsolicited comments we have received, this new package will have a very favorable consumer acceptance.
Very truly yours,
Vice President.
Encl.
Borden's

Mr. J. F. Watson, Vice-President of Borden's Farm Products Company, Inc., writes as follows:

> **"Enclosed is our second ad following the introduction of our new Grade A 'Golden Crest' Milk, which was made Thursday, June 7th. I take this opportunity of expressing our appreciation for the cooperation you have given us in working out suitable colors for this new bottle. Judging from the unsolicited comments we have received, this new package will have a very favorable consumer acceptance."**

The R. & H. Chemicals Department of the du Pont Company will be glad to cooperate with decorators or purchasers of decorated ceramic materials in selecting R & H Colors for particular purposes. A wide variety of R & H Chemicals and Colors is available for glassware, dinnerware, pottery, tile, heavy clay products and porcelain enamels.

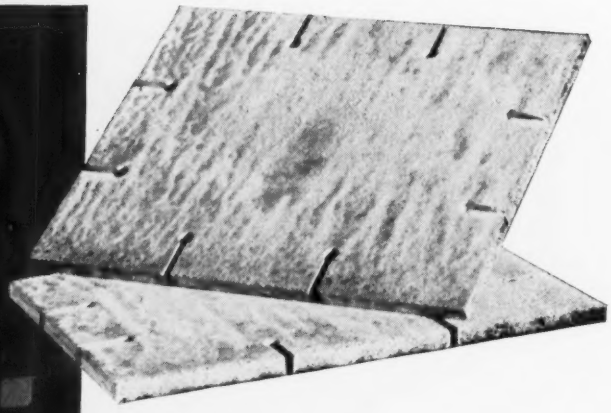
Write us about your requirements.

DU PONT

R&H Chemicals and Colors

THE R. & H. CHEMICALS DEPT., E. I. DU PONT DE NEMOURS & COMPANY, Inc.
Ceramic Section — Perth Amboy, New Jersey

District Sales Offices: BALTIMORE · BOSTON · CHARLOTTE · CHICAGO · CLEVELAND · KANSAS CITY
NEWARK · NEW YORK · PHILADELPHIA · PITTSBURGH · SAN FRANCISCO



Reducing Kiln Furniture Costs . . . .

In Periodic and Tunnel Kilns

EXTREMELY long life under severe operating conditions is provided by Norton Kiln Furniture—batts, saggers, supports, segmental rings and other shapes fabricated of Crystolon (silicon carbide) refractory material. It is extremely strong at high temperatures, resists the thermal shock attendant to operation in either periodic or tunnel kilns and has high heat transfer properties.

The Norton Slotted Batt (patent No. 1893123) has proven definitely superior to the plain, thin rectangular batt for duty in tunnel kilns. It has the refractory features of Crystolon material plus high resistance to cracking due to the slotted design.

It will pay you to reduce your operating costs by the use of Norton Kiln Furniture. Information on request—no obligation.

NORTON COMPANY
Worcester, Mass.
New York Chicago Cleveland

NORTON REFRACTORIES

R-487

NORTON PRODUCTS—Grinding Machines; Lapping Machines • Grinding Wheels; Abrasives for Polishing; India Oilstones, Pulpstones • Laboratory Ware, Refractories; Porous Plates • Non-Slip Tiles and Aggregates

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EXCESSIVE BREAKAGE!

Is this one of your problems?

Careful control of strain will eliminate excessive breakage and the B & L Polariscope is an excellent means of testing strain.

It will reveal strain caused by improper annealing, the wrong temperature or time in the lehr, "spotty" conditions in the lehr, or imperfect mixing of succeeding batches.

The B & L Polariscope takes objects up to 15 in. diameter. A special retardation plate produced contrast in strain colors. A new polarizing mirror gives a uniform field with less graininess, and sufficient light for colored and frosted objects.

For complete details write to Bausch & Lomb Optical Company, 654 St. Paul Street, Rochester, N. Y.

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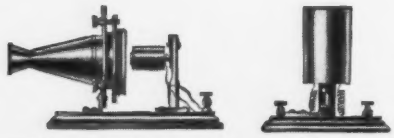
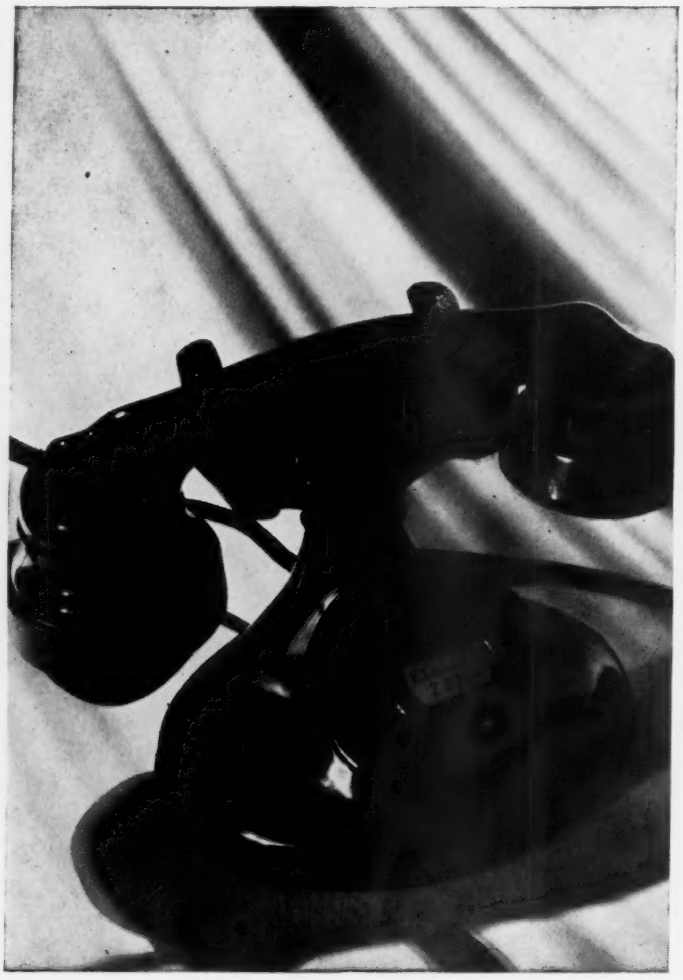


Telephone Transmitter and Receiver used at the Philadelphia Centennial

From one telephone to thirteen million



Fifty-eight years ago a telephone was demonstrated at the Philadelphia Centennial. Today, there are more than thirteen million Bell telephones in the United States. Three-quarters of a million people own the Bell System. They and their families would make a city larger than Philadelphia.

It took long years of pioneering, forward-looking planning and honest management to build the Bell System as it is today, a national institution fulfilling a national need.

It is a big system, for it serves a big country. It has grown in size and usefulness because it has been built upon the solid foundation of service to the public. Its constant purpose has been to give you the best possible telephone service, and the most, at the lowest cost consistent with financial safety.

The test of trying times has shown the soundness of its structure and the rightness of its one policy, one system and universal service.

Bell Telephone System

THEY start Sunday evening, September 30, at 6:30 E.S.T.—these popular Armco broadcasts that advertise the porcelain enameled products you make. Twenty-six NBC stations will tell the Armco story each week, entertaining millions of people, and reminding them that "it pays to know what's under the porcelain enamel finish!" This is Armco's twentieth year of national advertising, and the fifth year of radio broadcasting. Turn it to your advantage. Standardize on ARMCO ENAMELING IRON—the first iron made especially for fine porcelain enameling, and the most improved iron you can use today. Its good technical qualities bring you definite cost-savings; its wide spread public acceptance speeds sales wherever your products are sold. Label your work with the familiar Armco triangle, and share in the profits it helps earn for hundreds of satisfied enamelers.

"THE WORLD'S STANDARD"

ARMCO
ENAMELING IRON

THE AMERICAN ROLLING MILL COMPANY

Executive Offices: Middletown, Ohio

M and T

Sodium Antimonate

No matter where you look, you'll find no finer Sodium Antimonate than M & T. Its purity, fineness of grain and light fluffy texture set the standard for quality opacifiers.

Made of selected raw materials and scientifically processed with infinite care, every lot of M & T Sodium Antimonate is put through eleven exacting physical, chemical and enameling tests before it is shipped from the factory. You can depend on its uniform high quality to give you satisfactory results consistently.

M & T technicians have been solving enamelers' problems for more than twelve years. When trouble crops up, get in touch with M & T.

Metal & Thermit Corporation

120 BROADWAY, NEW YORK, N. Y.

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R. R. Danielson . . . Director of Research